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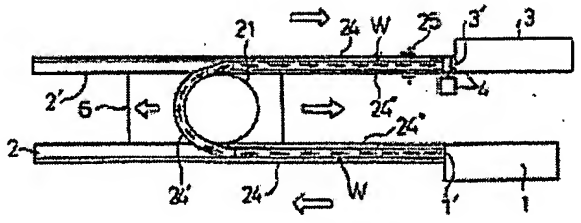
(54) (TITLE OF THE INVENTION) Workpiece Feeder with Buffering Mechanism

(57) (ABSTRACT) (contains corrections)
(PURPOSE) To provide a workpiece feeder with a buffering mechanism that can stably transport and supply workpieces where many need to be stored and some of the pieces may have a high center of gravity and be unstable.
(CONFIGURATION) It is equipped with an outer workpiece guide 24 that is fixed in place along the outside of the first conveyor 2 and a second conveyor 2 [*sic*] and an inside workpiece guide 24" that guides the workpieces W by expanding and contracting according to the motion of the semicircular workpiece guide from the semicircular workpiece guide 24' up to the exit 1' of the individual unit feeder 1 or the intake port 3' of the single-row feeder 3. Because the workpieces support each other they do not fall off of the conveyor or topple over in the direction they are being transported. Even arcs that have a high center of gravity and are unstable can be transported without falling over. Furthermore, by causing the semicircular workpiece guide 24', the rotating plate 21 and the main unit 6 to move continuously, the number of workpieces held (buffering function) during one operating cycle of the single-row feeder 3 can be increased.

W	Workpiece	4	Shutter
1	Initial Unit Feeder	6	Main Unit
1'	Exit	21	Rotating Plate
2	First Conveyor	24	Outer Workpiece Guide
2'	Second Conveyor	24'	Semicircular Workpiece Guide
3	Single-Row Feeder	24"	Inner Workpiece Guide
3'	Intake Port	25	Count Sensor



(SCOPE OF PATENT CLAIMS)
(CLAIM 1) A workpiece-feeding device with a buffering mechanism characterized in that it is provided with an individual unit feeder that releases the pieces of work one at a time; a conveyor that transports the workpieces that are released from the individual unit feeder; a single-row feeder that receives a specific number of workpieces that are transported on the conveyor in a single cycle and repeatedly releases these workpieces in single rows; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces, straddling the space between the first conveyor and the second conveyor, where placed at the entrance of this single-row feeder is a shutter that closes while the single-row feeder is releasing one cycle's worth of workpieces, stopping the workpieces that have been transported over the conveyor and holding them at the entrance to the single-row feeder, and [this shutter] then opens while the single-row feeder receives one cycle's worth of workpieces, allowing the single-row feeder to receive the workpieces that have been held at the entrance to the feeder, [said workpiece feeder] has an individual unit feeder that releases workpieces continuously, the entrance to the single-row feeder is placed in the same direction as the exit of the individual unit feeder and there is a first conveyor, which transports the workpieces that are released from the individual unit feeder and a second conveyor that receives the workpieces for the single-row feeder arranged in parallel and with an intervening gap; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces that are transported by the first conveyor onto the second conveyor, straddling the space between the first conveyor and the second conveyor; a rotating plate that helps to guide the transportation of the aforementioned workpieces, turning along the inside of this semicircular guide, where the rotating plate and the aforementioned semicircular workpiece guide are integrated into a single unit; a moving means that changes the effective operating length of the first conveyor and the second conveyor by moving in both directions along these conveyors between the first and second conveyors; a control means that controls the operation of this moving means; an outside workpiece guide that is fixed along the outside of the first conveyor and the second conveyor; and an inside workpiece guide that guides the workpieces by expanding and contracting along with the movement of the semicircular workpiece guide running along the inside of the first conveyor and the second conveyor, from the aforementioned semicircular workpiece guide to the entrance of the single-row feeder or the feed port of the individual unit feeder.
(DETAILED DESCRIPTION OF THE INVENTION)
(0001)
(INDUSTRIAL FIELD OF THE INVENTION) This invention pertains to workpiece feeders that supply workpieces to production equipment. In particular, it pertains to workpiece feeders that have buffering mechanisms that adjust the accumulation of workpieces being supplied when there are changes in the number of workpieces to be processed, such as when there are problems with production equipment.
(0002)
(PRIOR ART) In recent years, demand has been growing for such features as improved cycles and thorough administration of quality in various types of production equipment. As part of this trend, there has been demand for improved supply speed, supply stability and flexibility in devices that supply workpieces.
(0003) We will explain conventional workpiece feeders based on Figure 7 and 8.
(0004) In Figures 7 and 8, conventional workpiece feeders have an individual feed unit 1 that releases the workpieces W at intervals and one at a time, a conveyor 40 that transports the workpieces W that come from the individual unit feeder 1 and a single-row feeder 3, which repeatedly receives a specific number of workpieces in a cycle from the workpieces being transported by the conveyor 40 and then releases these workpieces, and at the entrance to this single-row feeder 3 a shutter 4 that closes while the one cycle's worth of workpieces W are released by the single-row feeder 3, stops and holds the workpieces that have been transported by the conveyor 40 at the entrance to the single-row feeder 3, and then opens, when the single-row feeder 3 receives one cycle's worth of workpieces W.
(0005)
(PROBLEM TO BE SOLVED BY THE INVENTION) However, in the configuration in the conventional workpiece feeders described above, in order to adjust the amount of work W supplied with the amount of processing by the production equipment, the work W has to be released to the conveyor 40 at intervals and the work W accumulates at the shutter 4, which is arranged at the entrance to the single-row feeder 3.
(0006) Thus, the individual feed unit releases work one piece at a time, so when there is work W with an unstable center of gravity, because of the interval between neighboring pieces of work that are being transported, there is no stability, which leads to problems of work falling and breaking during transport.
(0007) Additionally, when the operation time for one cycle of the single-row feeder 3 increases because of production equipment processing speeds or other reasons, there is a problem of so much work accumulating on the conveyor belt 40 that it becomes impossible to hold any more pieces there.
(0008) The challenge for this invention is to provide a workpiece feeder with a buffering mechanism that can respond to the amount of work that must be held on the conveyor belt and adjust the holding capacity of that work while supplying work with an unstable center of gravity and solving the aforementioned problems.
(0009)
(MEANS FOR SOLVING THE PROBLEM) In order to solve the above problems, the workpiece feeder with a buffering mechanism of this invention is characterized in that it is provided with an individual unit feeder that releases the pieces of work one at a time; a conveyor that transports the workpieces that are released from the individual unit feeder; a single-row feeder that receives a specific number of workpieces that are transported on the conveyor in a single cycle and repeatedly releases these workpieces in single rows; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces, straddling the space between the first conveyor and the second conveyor, where placed at the entrance of this single-row feeder is a shutter that closes while the single-row feeder is releasing one cycle's worth of workpieces, stopping the workpieces that have been transported over the conveyor and holding them at the entrance to the single-row feeder, and [this shutter] then opens while the single-row feeder receives one cycle's worth of workpieces, allowing the single-row feeder to receive the workpieces that have been held at the entrance to the feeder, [said workpiece feeder] has an individual unit feeder that releases workpieces continuously, the entrance to the single-row feeder is placed

in the same direction as the exit of the individual unit feeder and there is a first conveyor, which transports the workpieces that are released from the individual unit feeder and a second conveyor that receives the workpieces for the single-row feeder arranged in parallel and with an intervening gap; a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces that are transported by the first conveyor onto the second conveyor, straddling the space between the first conveyor and the second conveyor; a rotating plate that helps to guide the transportation of the aforementioned workpieces, turning along the inside of this semicircular guide, where the rotating plate and the aforementioned semicircular workpiece guide are integrated into a single unit; a moving means that changes the effective operating length of the first conveyor and the second conveyor by moving in both directions along these conveyors between the first and second conveyors; a control means that controls the operation of this moving means; an outside workpiece guide that is fixed along the outside of the first conveyor and the second conveyor; and an inside workpiece guide that guides the workpieces by expanding and contracting along with the movement of the semicircular workpiece guide running along the inside of the first conveyor and the second conveyor, from the aforementioned semicircular workpiece guide to the entrance of the single-row feeder or the feed port of the individual unit feeder.

(0010)

(OPERATION) The workpiece feeder with buffering mechanism of this invention has an outer workpiece guide that is fixed in place along the outside of the first conveyor and the second conveyor. It is also equipped with an inner workpiece guide along the inside of the first conveyor and second conveyor from the semicircular workpiece guide to the exit of the individual unit feeder that guides the workpieces by expanding and contracting along with the movement of the semicircular workpiece guide. This keeps the workpieces that are being transported over the conveyor from falling off and, because the individual unit feeder releases the workpieces continuously and without any gaps, there are no gaps between neighboring workpieces being transported on the conveyor. The workpieces thus support each other as they are being transported on the conveyor, which keeps them from toppling over. This allows stable transportation of even top-heavy workpieces.

(0011) Additionally, the workpiece feeder with buffering mechanism of this invention has a first conveyor that transports the workpieces released from the individual unit feeder and a second conveyor that delivers the workpieces to the single-row feeder that are placed in the same direction as the exit of the single unit feeder and the entrance to the single-row feeder. The conveyors are placed in parallel and with an intervening gap. Straddling the space between the first conveyor and the second conveyor is a semicircular workpiece guide that has a bottom surface and an outer surface that move the workpieces that are transported by the first conveyor onto the second conveyor. Turning along the inside of this semicircular guide is a rotating plate that helps to guide the transportation of the aforementioned workpieces. The rotating plate and the aforementioned semicircular workpiece guide are integrated into a single unit. Between the first and second conveyors is a moving means that changes the effective operating length of the first conveyor and the second conveyor by moving in both directions along these conveyors. There is a control means that controls the operation of this moving means, which makes it possible to adjust the number of workpieces being held on the first and second conveyors, meaning that there will be no problems in the number of units held, even if the number being processed by the production equipment varies.

(0012)

(EXAMPLES OF EMBODIMENT) We will explain an example of embodiment of the workpiece feeder with buffering mechanism of this invention with reference to Figures 1 through 7.

(0013) The embodiment in Figure 1 is equipped with a main unit 6 that has the following features. An individual unit feeder 1 that releases workpieces W continuously and without a gap, a single-row feeder 3 that has an entrance 3′ that is placed in the same orientation as the exit 1′ of the individual unit feeder 1, a first conveyor 2 that transports the workpieces W that are released by the individual unit feeder 1, a second conveyor 2′ that is placed parallel to the first conveyor 2 and with an intervening gap and delivers the workpieces W to the single-row feeder 3, a semicircular workpiece guide 24′ that straddles the space between the first conveyor 2 and the second conveyor 2′ that has an outer surface and a bottom surface that receive the workpieces W being transported by the first conveyor 2 and move them to the second conveyor 2′, a rotating plate 21, which helps guide the aforementioned transportation operation by rotating along the inside of the semicircular workpiece guide 24′, a moving means (not shown in Figure 1, see Figure 2) that changes the effective operating length of the first conveyor 2 and the second conveyor 2′ by moving in both directions along the conveyors between the first conveyor 2 and the second conveyor 2′ and which integrates the semicircular workpiece guide 24′ and the rotating plate 21, a shutter 4 that is placed at the entrance 3′ to the single-row feeder 3 and closes when the single-row feeder 3 is releasing one cycle's worth of workpieces W, stops and holds the workpieces that are being transported by the conveyors 2 and 2′ at the entrance 3′ to the single-row feeder 3 and then opens when the single-row feeder 3 receives a cycle's worth of workpieces W and delivers the workpieces W that had been held at the entrance 3′ to the single row feeder 3, into the single-row feeder 3, a control means (not shown in Figure 1, see Figure 2) that controls the operation of the aforementioned transportation means and has a count sensor 25 that is placed near the entrance 3′ to the single-row feeder 3, an outer workpiece guide 24 that is fixed in place along the outside of the first conveyor 2 and the second conveyor 2′ as well as an inside workpiece guide 24″, along the inside of the first conveyor 2 and the second conveyor 2′, that guides the workpieces W by expanding and contracting along with the movement of the semicircular workpiece guide 24′ from the aforementioned semicircular guide 24′ to the exit 1′ of the individual unit feeder 1 or to the entrance 3′ of the single-row feeder 3.

(0014) Next, we will use Figure 2 to explain the control means and the transport means in the embodiment shown in Figure 1.

(0015) In Figure 2, there is a housing 11 that houses the moving means (described below) that changes the effective length of the first conveyor 2 and the second conveyor 2′ by moving in both directions between and along the first conveyor 2 and the second conveyor 2′ as well as the semicircular guide 24′, which is integrated with the rotating plate 21. In addition to supporting the housing 11 by means of the guide 10 and the

guide rails 10′ the single-axis drive device 5 moves the main unit 6, which absorbs impact in transit by means of the urethane rubber stopper 7, spring 8 and shock absorber 9, in both directions between and along the first conveyor 2 and the second conveyor 2′.

(0016) In housing 11, the slide shaft 12 is placed so that it is parallel to the first conveyor 2 and the second conveyor 2′. The motor 16 is affixed to this slide shaft 12 over the slide bushing 13 and bracket 15. The rotating plate 21 is attached to this bracket 15 through the coupling 20.

(0017) The rotating plate 21 is integrated with the semicircular work guide 24′ and it rotates along the inside of the semicircular work guide 24′ and it moves in both directions between the first conveyor 2 and the second conveyor 2. The outside work guide 24 is fixed along the outside of the first conveyor 2 and the second conveyor 2.

(0018) Additionally, the aforementioned bracket 15 moves along the slide shaft 12, but it can be stopped at any point with the lock stopper 14, which is attached to the slide bushing 13. Also, a starting point sensor is located on the individual unit feeder 1 and single-row feeder 3 side on the inside surface of the housing 11 near the end of the slide shaft 12 and row sensor 18 is located on the semicircular workpiece guide 24′ side. Additionally, the bracket 15 is pulled toward the aforementioned starting point sensor 17 along the aforementioned slide shaft 12 by the uniform tension spring 19. Note also that the count sensor 25 located near the entrance 3′ (not shown in the diagram) to the single-row feeder 3 keeps trace of the number of workpieces W that have been received from the second conveyor 2 [*sic*].

(0019) Next, we will explain the operation of this embodiment based on the Figures 3 through 6.

(0020) Figure 3 shows the shutter 4 closed, the single-row feeder 3 releasing a single-row of one cycle's worth of workpieces W to the production equipment while the individual unit feeder 1 continues to release workpieces W onto the first conveyor. Figure 3 also shows the workpieces from the individual unit feeder as they are transported onto the first conveyor and that the force of their continued release moves the semicircular workpiece guide 24′ and the rotating plate 21 toward the row sensor 18. This state continues in Figure 4. Note also that the inside workpiece guide 24″ in Figure 1 has a dual-sliding construction that allows expansion and contraction. One end is affixed to the individual unit feeder 1 or to the single-row feeder 3 and the other end moves in concert with the semicircular workpiece guide 24′ and the rotating plate 21. The inner workpiece guide 24″ always guides the workpieces W from the individual unit feeder 1 or the single-row feeder 3 into the semicircular workpiece guide 24′ and the rotating plate 21. Additionally, the individual unit feeder 1 releases the workpieces W continuously and when the semicircular workpiece guide 24′ and the rotating plate 21 are moving, the motor 16 turns the rotating plate 21 and the rotation of the rotating plate 21 helps guide the moving workpieces W over the semicircular workpiece guide 24′.

(0021) Figure 4 shows the single-axis drive device 5 going into operation as the individual unit feeder 1 continues to release the workpieces W and those workpieces W are transported onto the first conveyor. This transporting force causes the semicircular workpiece guide 24′ and the rotating plate 21 to move and when they reach the row sensor 18, the row sensor 18 turns on, at which point the row sensor 18 sends out an "on" signal. This state continues in Figure 5.

(0022) Figure 5 shows the state when the single axis drive device 5 is stopped by the ON signal from the starting point sensor 18, when the single axis drive device 5 goes into operation, the main unit 6 moves in the direction of the row sensor 18, the semicircular work guide 24′ and the rotating plate 21 reach the starting point sensor 17 and the starting point sensor 18 turns on. Even in this state, the work W continues to be released by the individual unit feeder 1, that work W would be transported onto the first conveyor and the transporting force would move the semicircular work guide 24′ and the rotating plate 21 in the direction of the row sensor 18.

(0023) The release, by the single-row feeder 3 of a single row of one cycle's worth of workpieces W to the production equipment shown in Figure 3, stops at the points depicted in any of Figures 3, 4, and 5 above. As shown in Figure 6, the shutter 4 opens and at that point, the individual unit feeder 1 stops releasing workpieces W, the lock stopper 14 goes into operation and the semicircular workpiece guide 24′ and the rotating plate 21 stop at some position along the slide shaft 12. In this state, the single-axis drive device 5 moves the main unit to the starting point sensor 17 side and the workpieces W are fed into the single-row feeder 3. In this case, the distance moved by the main unit 6 is the length of the specific number of workpieces W supplied. Once the specific number of workpieces W has been supplied, the shutter 4 closes.

(0024) After the closing operation of this shutter 4, the operation in Figures 3 through 6 will be repeated.

(0025) In this embodiment, as noted above, the continuous movement of the semicircular work guide 24′, the rotating plate 21 and the main unit 6 makes it possible for the amount of work W that can be held (buffering function) within one cycle of operation of the single-row feeder 3 to be increased. For this reason, if the one-cycle operation time of the single-row feeder 3 should increase due to a slowing down of the processing speed of the production equipment, and the amount that has to be held increases, the traditional problem of not being able to accommodate that can be solved.

(0026) Additionally, the semicircular work guide 24′ and the rotating plate 21 will move under the force of the work W as it continues to be transported, so the space between the work W as it is transported will always be kept close and maintained at a constant pressure. The work W will always fill the conveyor and the guide, so even workpieces W that would be unstable individually can press up against each other and be transported stably without falling over.

(0027) The workpiece feeder with buffering mechanism of this invention is capable of various formats and is not limited to the embodiment described above. For example, the design of the conveyors, guides, transportation means, control means, sensors and other elements shutters may assume any design depending upon the purpose.

(0028)

(EFFECT OF THE INVENTION) The workpiece feeder with buffering mechanism of this invention has the following effect. It can increase the number of workpieces held (buffering function) in one operating cycle of the single-row feeder. In this way, the problem of insufficient holding of workpieces associated with traditional systems is solved and even if the processing speed of the production equipment should slow down for whatever reason and an operating cycle of the single-row feeder 3 should increase, the required number of workpieces can be secured and production can continue unobstructed.

(0029) Additionally, the workpiece feeder with buffering mechanism of this invention always keeps the workpieces W close together and at a constant pressure while they are being transported. The workpieces always fill the space on the conveyor and guide, so that even workpieces W that would be unstable individually, will support each other and be transported in a stable manner without falling over.

(BRIEF DESCRIPTION OF THE DRAWINGS)

(FIGURE 1) is a flat diagram of an embodiment of this invention.

(FIGURE 2) is an enlarged detail of the main elements in Figure 1.

(FIGURE 3) is an operating diagram of Figure 1.

(FIGURE 4) is an operating diagram of Figure 1.

(FIGURE 5) is an operating diagram of Figure 1.

(FIGURE 6) is an operating diagram of Figure 1.

(FIGURE 7) is a flat diagram of a conventional system.

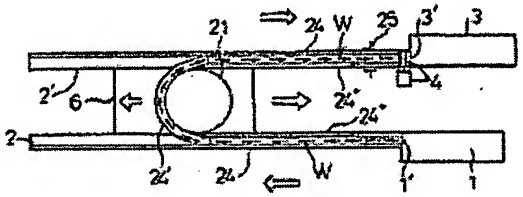
(FIGURE 8) is a side view diagram of a conventional system.

(EXPLANATION OF REFERENCES)

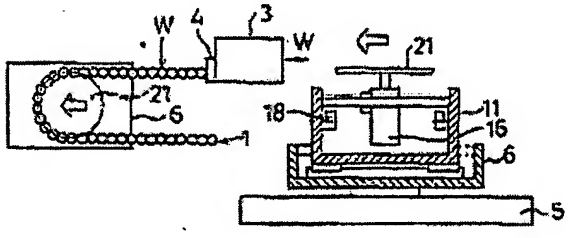
W	Workpiece
1	Initial Unit Feeder
1′	Exit
2	First Conveyor
2′	Second Conveyor
3	Single-Row Feeder
3′	Intake Port
4	Shutter
5	Single-Axis Drive Device
6	Main Unit
7	Stopper
8	Spring
9	Absorber
10	Guide
10′	Guide Rail
11	Housing
12	Slide Shaft
13	Slide Bushing
14	Lock Stopper
15	Bracket
16	Motor
17	Starting Point Sensor
18	Row Sensor
19	Uniform Tension Spring
20	Coupling
21	Rotating Plate
24	Outer Workpiece Guide
24′	Semicircular Workpiece Guide
24″	Inner Workpiece Guide
25	Count Sensor

(FIGURE 1)

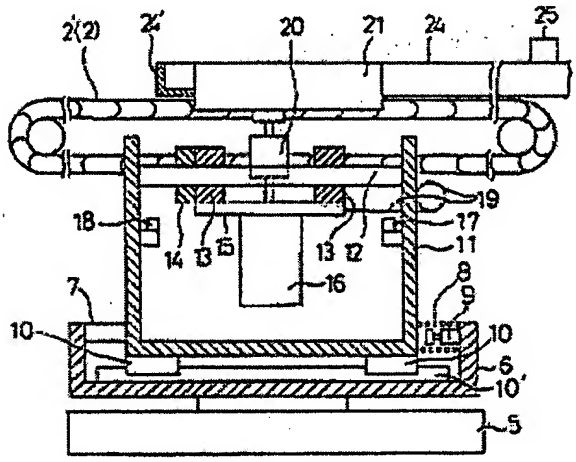
W	Workpiece	4	Shutter
1	Initial Unit Feeder	6	Main Unit
1′	Exit	21	Rotating Plate
2	First Conveyor	24	Outer Workpiece Guide
2′	Second Conveyor	24′	Semicircular Workpiece Guide
3	Single-Row Feeder	24″	Inner Workpiece Guide
3′	Intake Port	25	Count Sensor



(FIGURE 3)

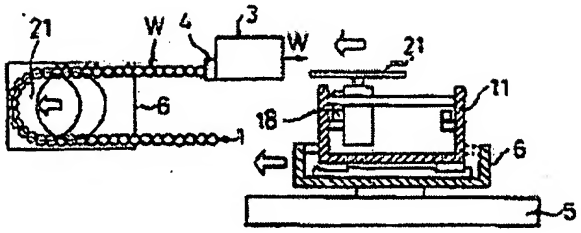


(FIGURE 2)

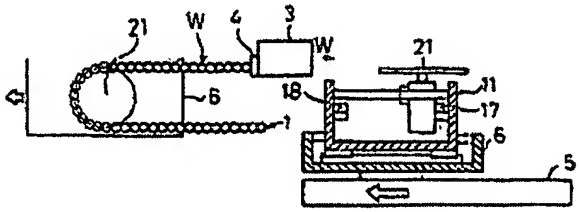


5	Single-Axis Drive Device	13	Slide Bushing
7	Stopper	14	Lock Stopper
8	Spring	15	Bracket
9	Absorber	16	Motor
10	Guide	17	Starting Point Sensor
10′	Guide Rail	18	Row Sensor
11	Housing	19	Uniform Tension Spring
12	Slide Shaft	20	Coupling

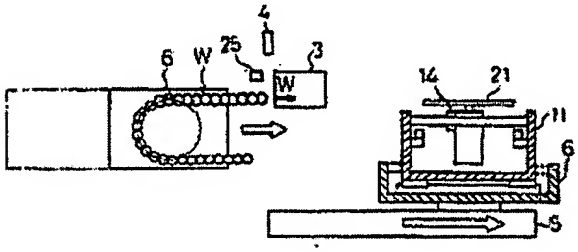
(FIGURE 4)



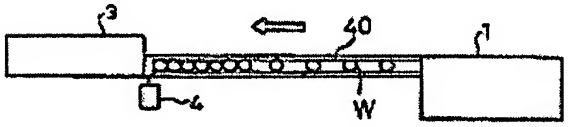
(FIGURE 5)



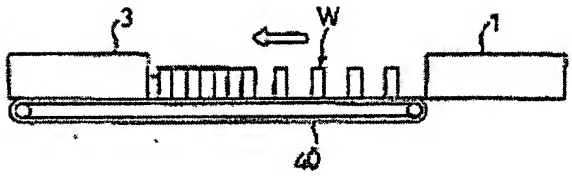
(FIGURE 6)



(FIGURE 7)



(FIGURE 8)



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PATENT ABSTRACTS OF JAPAN

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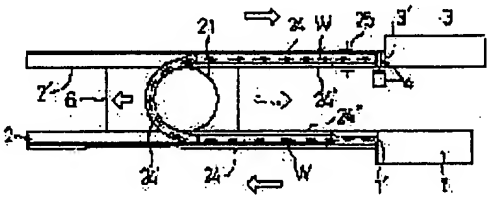
(54) WORK FEEDER WITH BUFFER MECHANISM

(57)Abstract:
PURPOSE: To attain a work feeder with a buffer function which provides a large amount of work storage and carries and feeds even a work of unstable center of gravity with high stability.
CONSTITUTION: This work feeder is provided with an outside guide 24 for works fixedly-arranged along the outsides of the first conveyer 2 and the second conveyer 2, and an inside guide 24″ for works which guides a work W by expanding or contracting with the movement of a semi-circular guide for works, ranging from a semi-circular guide 24' for works to the receiving part 3' of the discharge port 1' of a single discharging machine 1 or the receiving port 3' of a one-row discharging machine 3 along the insides of the first conveyer and the second conveyer 1'. Since the works do not incline to the outside of the conveyer, and support each other and do not incline in the carrying direction of the conveyer, even works of unstable center of gravity are delivered with high stability. Besides, the semi-circular guide 24' for works, a rotating plate 21 and a body 6 are moved continuously, so that it is possible to increase the storage amount (buffer function) of the works W within one cycle operation period of the one- row discharging machine 3.



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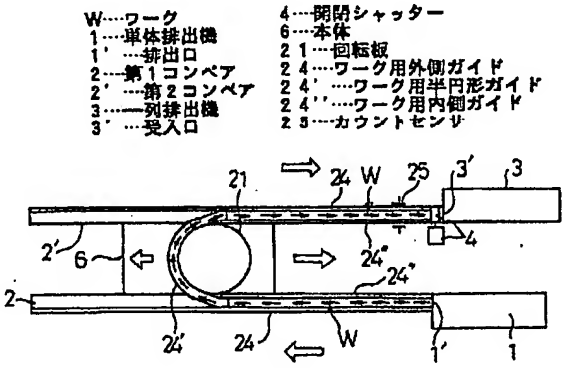
(54)【発明の名称】　バッファ機構付ワーク供給装置

(57)【要約】　(修正有)

【目的】　ワーク貯留量が大きく、重心不安定なワークでも安定して搬送・供給が可能なバッファ機構付ワーク供給装置を提供する。

【構成】　第１コンベア２と第２コンベア２の外側に沿って固定配置されたワーク用外側ガイド２４と、第１コンベアと第２コンベアの内側に沿って、ワーク用半円形ガイド２４′から単体排出機１の排出口１′又は一列排出機３の受入口３′までを、ワーク用半円形ガイドの移動に伴って伸縮してワークＷをガイドするワーク用内側ガイド２４″とを備える。ワークはコンベアの外側に倒れず、又ワークが相互に支え合ってコンベアの搬送方向に倒れないので、重心不安定なアークでも安定して搬送される。また、ワーク用半円形ガイド２４′と回転板２１と本体６とを連続的に移動させることで、一列排出機３の１サイクル動作時間内のワークＷの貯留量（バッファー機能）が増大させられる。



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【特許請求の範囲】

【請求項１】　ワークを１つずつ排出する単体排出機と、単体排出機から排出されたワークを搬送するコンベアーと、コンベアーで搬送されて来たワークから１サイクル分の所定数のワークを受けて、これらのワークを一列排出する動作を繰り返す一列排出機と、この一列排出機の受入口に配され、一列排出機が１サイクル分のワークを排出動作中は、閉じて、コンベアーで搬送されて来たワークを一列排出機の受入口に停止させて貯留し、一列排出機が１サイクル分のワークを受入れ中は、開いて、一列排出機の受入口で貯留していたワークを一列排出機に受入れさせる開閉シャッターとを有するワーク供給装置において、単体排出機はワークを間隔をおかず連続して排出する単体排出機とし、単体排出機の排出口と一列排出機の受入口とを同一方向に向けて配し、単体排出機から排出されるワークを搬送する第１コンベアと一列排出機にワークを受け取らせる第２コンベアとを間隔をおいて平行に配し、第１コンベア上から第２コンベア上間に跨がって第１コンベアが搬送してくるワークを受けて第２コンベアに移載する底面及び外側面を有するワーク用半円形ガイドと、このワーク用半円形ガイドの内側に沿って回転し前記のワーク移載動作を補助ガイドする回転板と、前記ワーク用半円形ガイドと回転板とを一体的にして、第１コンベアと第２コンベア間をこれらコンベアに沿って両方向に移動させて第１コンベアと第２コンベアの実効動作長を変える移動手段と、この移動手段の動作を制御する制御手段と、第１コンベアと第２コンベアの外側に沿って固定配置されたワーク用外側ガイドと、第１コンベアと第２コンベアの内側に沿って、前記ワーク用半円形ガイドから単体排出機の排出口又は一列排出機の受入口までを、ワーク用半円形ガイドの移動に伴って伸縮してワークをガイドするワーク用内側ガイドとを備えることを特徴とするバッファ機構付ワーク供給装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、生産設備にワークを供給するワーク供給装置に関し、特に、生産設備のトラブル等で、ワーク処理量に変動があった場合に、供給ワークの貯留量を調整するバッファ機構付ワーク供給装置に関するものである。

【０００２】

【従来の技術】近年、各種生産設備において、タクト向上、品質管理の徹底等の種々の要望が増加し、これに伴って、ワーク供給装置にも、供給スピードの向上、供給の安定化、供給の融通性等の種々の要望が発生している。

【０００３】次に、ワーク供給装置の従来例を図７、図８に基づいて説明する。

【０００４】図７、図８において、従来例のワーク供給装置は、ワークＷを１つずつ間隔をおいて排出する単体排出機１と、単体排出機１から排出されたワークＷを搬送するコンベアー４０と、コンベアー４０で搬送されて来たワークＷから１サイクル分の所定数のワークＷを受けて、これらのワークＷを一列排出する動作を繰り返す一列排出機３と、この一列排出機３の入口に配され、一列排出機３が１サイクル分のワークＷを排出動作中は、閉じて、コンベアー４０で搬送されて来たワークＷを一列排出機３の入口に停止させて貯留し、一列排出機３が１サイクル分のワークＷを受入れ中は、開いて、一列排出機３の入口で貯留していたワークＷを一列排出機３に受入れさせる開閉シャッター４とを有する。

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【０００５】

【発明が解決しようとする課題】しかし、上記の従来例のワーク供給装置の構成では、生産設備の処理量とワークＷの供給量とを調整するために、ワークＷを間隔をおいてコンベア４０上に排出し、一列排出機３の入口に配されたシャッター４でワークＷを貯留している。

【０００６】従って、単体排出機１はワークＷを１つずつ間隔をおいて排出するので、重心不安定なワークＷの場合には、隣接して搬送されるワークＷの間に間隔があるために、安定性がなく、搬送中に転倒・破損するという問題点がある。

【０００７】又、生産設備の処理速度等との関係で、一列排出機３の１サイクルの動作時間が長くなった場合、コンベア４０上に貯留されるワーク量が過多となって貯留できなくなるという問題点がある。

【０００８】本発明は、上記の問題点を解決し、重心不安定なワークでも安定して供給することができ、コンベア上に貯留の必要があるワーク量に応じて、ワークの貯留可能量を増減できるバッファ機構付ワーク供給装置を提供することを課題としている。

【０００９】

【課題を解決するための手段】本発明のバッファ機構付ワーク供給装置は、上記の問題点を解決するために、ワークを１つずつ排出する単体排出機と、単体排出機から排出されたワークを搬送するコンベアーと、コンベアーで搬送されて来たワークから１サイクル分の所定数のワークを受けて、これらのワークを一列排出する動作を繰り返す一列排出機と、この一列排出機の受入口に配され、一列排出機が１サイクル分のワークを排出動作中は、閉じて、コンベアーで搬送されて来たワークを一列排出機の受入口に停止させて貯留し、一列排出機が１サイクル分のワークを受入れ中は、開いて、一列排出機の受入口で貯留していたワークを一列排出機に受入れさせる開閉シャッターとを有するワーク供給装置において、単体排出機はワークを間隔をおかず連続して排出する単体排出機とし、単体排出機の排出口と一列排出機の受入口とを同一方向に向けて配し、単体排出機から排出されるワークを搬送する第１コンベアと一列排出機にワーク

を受け取らせる第２コンベアとを間隔をおいて平行に配し、第１コンベア上から第２コンベア上間に跨がって第１コンベアが搬送してくるワークを受けて第２コンベアに移載する底面及び外側面を有するワーク用半円形ガイドと、このワーク用半円形ガイドの内側に沿って回転し前記のワーク移載動作を補助ガイドする回転板と、前記ワーク用半円形ガイドと回転板とを一体的にして、第１コンベアと第２コンベア間をこれらコンベアに沿って両方向に移動させて第１コンベアと第２コンベアの実効動作長を変える移動手段と、この移動手段の動作を制御する制御手段と、第１コンベアと第２コンベアの外側に沿って固定配置されたワーク用外側ガイドと、第１コンベアと第２コンベアの内側に沿って、前記ワーク用半円形ガイドから単体排出機の排出口又は一列排出機の受入口までを、ワーク用半円形ガイドの移動に伴って伸縮してワークをガイドするワーク用内側ガイドとを備えることを特徴とする。

【００１０】

【作用】本発明のバッファ機構付ワーク供給装置は、第１コンベアと第２コンベアの外側に沿って固定配置されたワーク用外側ガイドと、第１コンベアと第２コンベアの内側に沿って、ワーク用半円形ガイドから単体排出機の排出口又は一列排出機の受入口までを、ワーク用半円形ガイドの移動に伴って伸縮してワークをガイドするワーク用内側ガイドとを備えているので、コンベア上を搬送されているワークがコンベアの外側に倒れないことと、単体排出機はワークを間隔をおかず連続して排出するので、コンベアが搬送中の隣接ワーク間に間隔がなく、コンベア上を搬送されているワークが相互に支え合ってコンベアの搬送方向に倒れないこととによって、重心不安定なワークであっても、安定して搬送される。

【００１１】又、本発明のバッファ機構付ワーク供給装置は、単体排出機の排出口と一列排出機の受入口とを同一方向に向けて配し、単体排出機から排出されるワークを搬送する第１コンベアと一列排出機にワークを受け取らせる第２コンベアとを間隔をおいて平行に配し、第１コンベア上から第２コンベア上間に跨がって第１コンベアが搬送してくるワークを受けて第２コンベアに移載するワーク用半円形ガイドと、このワーク用半円形ガイドの内側に沿って回転し前記のワーク移載動作を補助ガイドする回転板と、前記ワーク用半円形ガイドと回転板とを一体的にして、第１コンベアと第２コンベア間をこれらコンベアに沿って両方向に移動させて第１コンベアと第２コンベアの実効動作長を変える移動手段と、この移動手段の動作を制御する制御手段とを備えているので、第１コンベアと第２コンベアの実効動作長の変更によって、第１コンベア上と第２コンベア上のワークの貯留量の増減が可能になり、生産設備の処理量が変動しても、貯留量に問題が起きることは無い。

【００１２】

【実施例】本発明のバッファ機構付ワーク供給装置の一実施例を図１～図７に基づいて説明する。

【００１３】図１において、本実施例は、ワークＷを間隔をおかず連続して排出する単体排出機１と、単体排出機１の排出口１′と同一方向に向いた受入口３′を有する一列排出機３と、単体排出機１から排出されるワークＷを搬送する第１コンベア２と、一列排出機３にワークＷを受け取らせると共に第１コンベア２とは間隔をおいて平行に配されている第２コンベア２′と、第１コンベア２上から第２コンベア２′上間に跨がって第１コンベア２が搬送してくるワークＷを受けて第２コンベア２′に移載する底面及び外側面を有するワーク用半円形ガイド２４′と、このワーク用半円形ガイド２４′の内側に沿って回転し前記の移載動作を補助ガイドする回転板２１と、ワーク用半円形ガイド２４′と回転板２１とを一体的にして、第１コンベア２と第２コンベア２′間をこれらコンベアに沿って両方向に移動させて第１コンベア２と第２コンベア２′の実効動作長を変える移動手段（図１には図示せず、図２参照）を備えた本体６と、一列排出機３の受入口３′に配され、一列排出機３が１サイクル分のワークＷを排出動作中は、閉じて、コンベア２、２′で搬送されて来たワークＷを一列排出機３の受入口３′に停止させて貯留し、一列排出機３が１サイクル分のワークＷを受入れ中は、開いて、一列排出機３の受入口３′で貯留していたワークＷを一列排出機３に受入れさせる開閉シャッター４と、一列排出機３の受入口３′の近傍に配されたカウントセンサ２５を有し前記移動手段の動作を制御する制御手段（図１には図示せず、図２参照）と、第１コンベア２と第２コンベア２′の外側に沿って固定配置されたワーク用外側ガイド２４と、第１コンベア２と第２コンベア２′の内側に沿って、前記ワーク用半円形ガイド２４′から単体排出機１の排出口１′又は一列排出機３の受入口３′までを、ワーク用半円形ガイド２４′の移動に伴って伸縮してワークＷをガイドするワーク用内側ガイド２４″とを備えている。

【００１４】次に、図１に示す本実施例の移動手段と制御手段とを図２に基づいて説明する。

【００１５】図２において、一軸駆動装置５が、ワーク用半円形ガイド２４′と回転板２１とを一体的にして、第１コンベア２と第２コンベア２′間をこれらコンベアに沿って両方向に移動させて第１コンベア２と第２コンベア２′の実効動作長を変える移動手段（後述）を内蔵するハウジング１１と、このハウジング１１をガイド１０とガイドレール１０′とを介して支持すると共に、ウレタンゴム製ストッパー７とバネ８とアブソーバー９とで移動時の衝撃を吸収する本体６とを、第１コンベア２と第２コンベア２′間をこれらコンベアに沿って両方向に移動させる。

【００１６】ハウジング１１内には、スライドシャフト

１２が第１コンベア２と第２コンベア２′に対して平行に設けられ、このスライドシャフト１２には、スライドブッシュ１３とブラケット１５とを介してモータ１６が取り付けられている。このブラケット１５にはカップリング２０を介して回転板２１が取り付けられている。

【００１７】この回転板２１はワーク用半円形ガイド２４′の内側に沿って回転しワーク用半円形ガイド２４′と一体的になって、第１コンベア２と第２コンベア２間を両方向に移動する。第１コンベア２と第２コンベア２の外側に沿ってワーク用外側ガイド２４が固定されている。

【００１８】そして、前記ブラケット１５は、スライドシャフト１２に沿って移動するが、任意の位置で、スライドブッシュ１３に取り付けられたロックストッパ１４によって、停止される。又、スライドシャフト１２の端部近傍のハウジング１１の内面の、単体排出機１及び一列排出機３側に原点センサが、ワーク用半円形ガイド２４′側に行センサ１８が配され、又、ブラケット１５は一定張力のバネ１９によって前記スライドシャフト１２に沿って前記原点センサ１７側に引っ張られている。尚、一列排出機３の受入口３′（図示せず）近傍に配されるカウントセンサ２５は、一列排出機３が第２コンベア２から受け取るワークＷの数をカウントする。

【００１９】次に、本実施例の動作を図３～図６に基づいて説明する。

【００２０】図３は、開閉シャッター４が閉じ、一列排出機３が１サイクル分のワークＷを生産設備に一列排出中で、単体排出機１がワークＷを第１コンベア上に連続して排出している状態を示す。又、図３は、単体排出機１がワークＷを連続して排出するその排出力で、ワークＷは第１コンベア上を搬送され、この搬送力で、ワーク用半円形ガイド２４′と回転板２１とが、行センサ１８側に移動して行くことを示し、この状態が図４に続く。尚、図１に示すワーク用内側ガイド２４″は、伸縮可能な２重スライド構造で、その一端は、単体排出機１又は一列排出機３側に固定され、他端はワーク用半円形ガイド２４′及び回転板２１と一体的に移動し、ワーク用内側ガイド２４″は、常に、単体排出機１又は一列排出機３からワーク用半円形ガイド２４′及び回転板２１までのワークＷをガイドする。又、単体排出機１がワークＷを連続して排出し、ワーク用半円形ガイド２４′と回転板２１とが移動しているときには、モータ１６が回転板２１を回転し、回転板２１の回転は、ワーク用半円形ガイド２４′上をワークＷが移動するのを補助ガイドする。

【００２１】図４は、更に、単体排出機１がワークＷを連続して排出し、そのワークＷが第１コンベア上を搬送され、この搬送力で、ワーク用半円形ガイド２４′と回転板２１とが移動して、行センサ１８まで到達し、行センサ１８がＯＮ状態になり、行センサ１８からのＯＮ信号によって、一軸駆動装置５が作動した時点を示し、この状態が図５に続く。

【００２２】図５は、一軸駆動装置５が作動して、本体６が行センサ１８方向に移動し、ワーク用半円形ガイド２４′と回転板２１とが原点センサ１７まで到達し、原点センサ１８がＯＮ状態になり、原点センサ１８からのＯＮ信号によって、一軸駆動装置５が停止した状態を示す。この状態でも、更に、単体排出機１のワークＷの排出が続き、そのワークＷが第１コンベア上を搬送され、この搬送力で、ワーク用半円形ガイド２４′と回転板２１とを、行センサ１８方向に移動させる。

【００２３】図３に示される一列排出機３の１サイクル分のワークＷの生産設備への一列排出動作は、上記図３、図４、図５の何れかの時点で終了し、図６に示すように、開閉シャッター４が開く、この時点で、単体排出機１のワークＷの排出が止まり、ロックストッパー１４が作動して、ワーク用半円形ガイド２４′と回転板２１とが、スライドシャフト１２上の任意の位置で停止する。この状態で、一軸駆動装置５が、本体６を、原点センサ１７側に移動させて、ワークＷを、一列排出機３に供給する。この場合の本体６の移動距離は、供給されるワークＷの所定個数分の長さになり、所定個数のワークＷの供給が終了すると、開閉シャッター４が閉じる。

【００２４】この開閉シャッター４の閉動作に続いて、図３～図６の動作が繰り返される。

【００２５】本実施例では、上記のようにして、ワーク用半円形ガイド２４′と回転板２１と本体６との連続した移動によって、一列排出機３の１サイクル動作時間内のワークＷの貯留量（バッファー機能）の増大が可能なので、生産設備の処理速度低下等で、一列排出機３の１サイクルの動作時間が長くなって必要貯留量が増加しても、従来例の貯留できなくなるという問題点を解消できる。

【００２６】又、連続して搬送されて来るワークＷの搬送力で、ワーク用半円形ガイド２４′と回転板２１とが移動するために、搬送中のワークＷ間は、常に、一定圧で密着した状態であり、コンベア上及びガイド上は、常に、ワークＷで満杯状態なので、単独では不安定なワークＷでも、相互に支え合って、倒れることなく、安定して搬送される。

【００２７】本発明のバッファ機構付ワーク供給装置は、上記の実施例に限らず種々の態様が可能でる。例えば、各種コンベア、各種ガイド、開閉シャッター、移動手段、制御手段、センサ等の設計は目的に合わせて自由に設計できる。

【００２８】

【発明の効果】本発明のバッファ機構付ワーク供給装置は、一列排出機の１サイクル動作時間内のワークＷの貯留量（バッファー機能）の増大が可能なので、従来例のワークＷの貯留量不足発生の問題点を解決し、何らかの

理由で、生産設備の処理速度が低下し、一列排出機３の１サイクルの動作時間が長くなっても、必要貯留量を確保でき、連続作業に支障を来たさないという効果を奏する。

【００２９】又、本発明のバッファ機構付ワーク供給装置は、搬送中のワークW間は、常に、一定圧で密着した状態であり、コンベア上及びガイド上は、常に、ワークWで満杯状態なので、単独では不安定なワークWでも、相互に支え合って、倒れることなく、安定して搬送されるという効果を奏する。

【図面の簡単な説明】

【図１】本発明の一実施例の平面図である。

【図２】図１の要部の一部拡大図である。

【図３】図１の動作図である。

【図４】図１の動作図である。

【図５】図１の動作図である。

【図６】図１の動作図である。

【図７】従来例の平面図である。

【図８】従来例の側面図である。

【符号の説明】

W　ワーク

１　単体排出機

１′　排出口

２　第１コンベア

２′　第２コンベア

３　一列排出機

３′　受入口

４　開閉シャッター

５　一軸駆動装置

６　本体

７　ストッパー

８　バネ

９　アブソーバー

１０　ガイド

１０′　ガイドレール

１１　ハウジング

１２　スライドシャフト

１３　スライドブッシュ

１４　ロックストッパー

１５　ブラケット

１６　モータ

１７　原点センサ

１８　行センサ

１９　一定張力バネ

２０　カップリング

２１　回転板

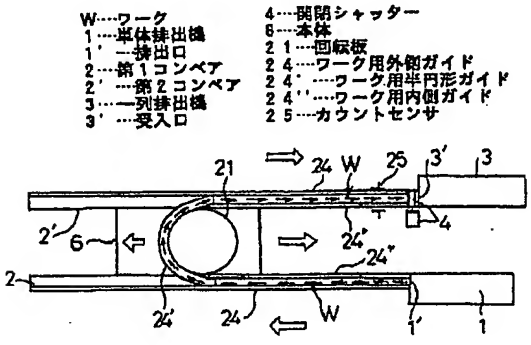
２４　ワーク用外側ガイド

２４′　ワーク用半円形ガイド

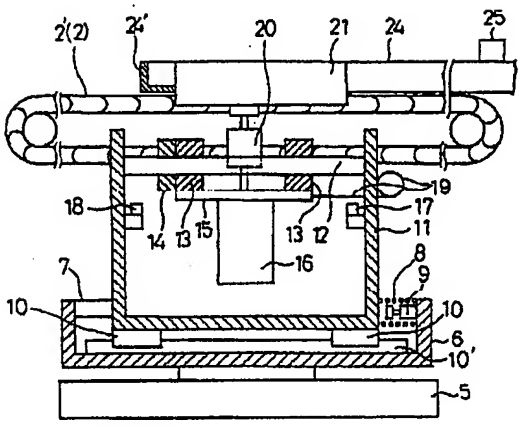
２４″　ワーク用内側ガイド

２５　カウントセンサ

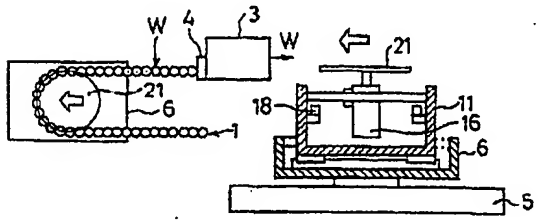
【図１】



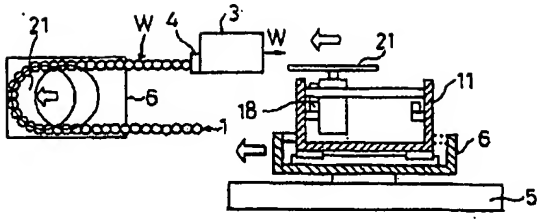
【図２】



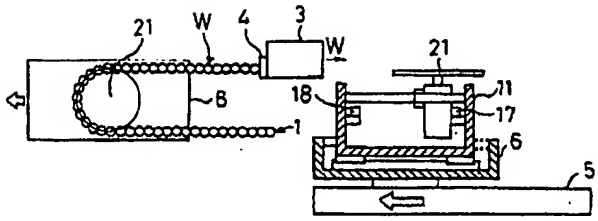
【図３】



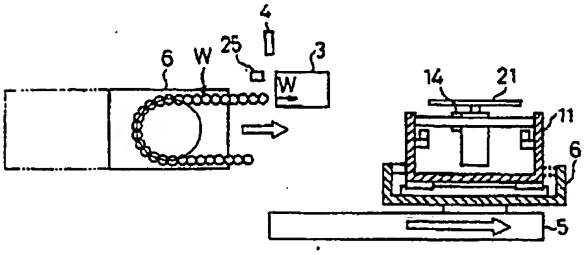
【図４】



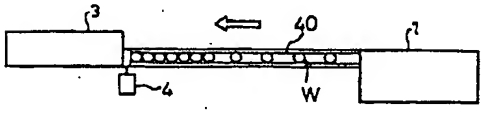
【図５】



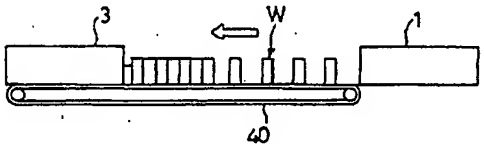
【図６】



【図７】



【図８】



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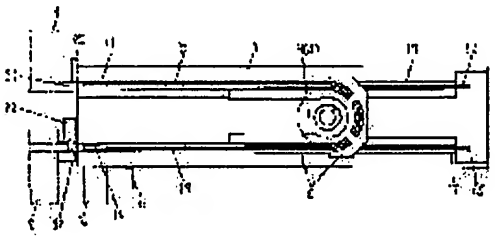
(54) ROUND BELT CONVEYOR AND USE THEREOF

(57)Abstract:
PURPOSE: To provide a round belt conveyor which safely carries works without damages, is provided with the buffer function to change the hold-up volume of the works, and is preferable as a work supplying device.
CONSTITUTION: A belt conveyor is endlessly circulated through pulleys 8-15 provided to a movable frame 6 which is movable relative to a fixed frame 5 having an entrance 31 and an exit 32 of the conveyor, the fixed frame 5 and the movable frame 6. A round belt 17 to carry works to be carried thereon is provided between the passage from the entrance 31 to the exit 32 through the pulley 9 of the movable frame 6, and the movable frame 6 is moved according to the difference between the number of the carried works which flow into from the entrance 31 of the conveyor, and the number of the carried works which flow out of the exit 32, where the numbers are sensed by sensors 20, 21, and the round belt conveyor changes its conveyor length so that the works to be carried is always fully loaded between the entrance 31 and the exit 32.



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